

REMARKS/ARGUMENTS

The Examiner is thanked for the careful review of the application as set out in the outstanding office action. Reconsideration of the application is respectfully requested.

Claims 1, 5-6, 10, 14-15, 22 stand rejected under 35 USC 103 as being unpatentable over Dunand in view of Takagi et al. ("Takagi"). This rejection is respectfully traversed on the ground that a prima facie case of obviousness has not been established, and the references do not teach or suggest the claimed invention.

Dunand describes a process for compensation of a defect in the advance of a print substrate by modifying the arrival position of ink droplets with a variable electrical charge on the substrate. Each band of droplets is printed with a mark on the margin or edge of the substrate, the substrate is advanced to print the next band, an algebraic difference is determined between a nominal theoretical position of the mark and the real position of the mark, a correction to the value of the charge voltage to be applied to each droplet to compensate for the position error is determined, and the substrate correction is applied to each droplet in the next band, in addition to the nominal voltage. (Abstract) Thus, the printing of the mark is performed during printing of normal print jobs.

Claim 1 recites a diagnostic method for visual detection of poor media advance calibration in an ink-jet printing system, comprising:

- entering a diagnostic mode of the printing system in which mode normal printing jobs of the printing system are not printed;

- printing different areas of a diagnostic pattern at different passes of one or more ink-jet printheads with a controlled amount of media advances between the passes, to accumulate media advance error between the printing of the different areas; and

examining the diagnostic pattern to determine whether the accumulated media advance error is sufficiently objectionable to take corrective action.

Dunand clearly does not disclose entering a diagnostic mode as recited in Claim 1. This is undisputed.

The Examiner alleges Takagi as disclosing a process in a printer comprising a step of entering a diagnostic mode of the printing system in which normal printing jobs are not printed (FIG. 12A, step S102: PRINT DETECTION PATTERN), and an initial step of checking for printhead health (FIG. 12, step S104: NON-DISCHARGE NOZZLE IS PRESENT) and taking any corrective needed action prior to printing said diagnostic pattern (Abstract: After abnormal nozzles are detected, data related to such abnormal nozzles are removed).

Takagi describes a recording apparatus to perform complementary recording to eliminate a white streak caused by recording elements becoming incapable of recording. Preceding printing, abnormal nozzles are detected, and data related to the abnormal nozzles are removed. One scan printing is performed in accordance with such data. Preceding the returning operation of the printing head subsequent to the one scan, a sub-scanning operation is performed so that normal nozzles are positioned in a location corresponding to the white streak appearing in the one scan printing. While returning the printing head, the printing is performed in accordance with such data related to the abnormal nozzles detected at the time of one scan, hence executing a complementary recording appropriately. (Takagi, Abstract)

Takagi thus has nothing to do with the problem of poor media advance calibration in an ink-jet printing system. Instead, Takagi addresses a case in which a nozzle of the printhead is not printing normally. The diagnostic mode of Takagi does not print different areas of a diagnostic pattern at different passes with a controlled amount of media advance between the passes, to accumulate media advance error. Nor is there any teaching in Takagi to examine a diagnostic pattern to determine whether the accumulated media advance error is sufficiently objectionable to take corrective action.

The Examiner states that it would have been obvious to modify "the printing process disclosed by Dunand such that including the step of entering diagnostic mode that checks printhead health and takes any corrective needed action as disclosed by Takagi et al. The motivation of doing so is to provide a liquid discharge apparatus capable of obtaining the desired result of discharges without any defects even when non-discharge or another malfunction occurs in the discharging means as taught by Takagi. Applicants respectfully disagree.

Modifying Dunand with teachings of Takagi would at most result in a printing system with a diagnostic mode having an abnormal nozzle detection scheme, and using a sub-scanning operation to fill in white streaks caused by the abnormal nozzle. The diagnostic method of Claim 1 still does not result from the purported modification.

The Federal Circuit stated the law of obviousness in In re Kotzab, 55 USPQ 2d 1313, 1316-1317 (Fed.Cir. 2000):

"A critical step in analyzing the patentability of claims pursuant to section 103(a) is casting the mind back to the time of invention, to consider the thinking of one of ordinary skill in the art, guided only by the prior art references and the then-accepted wisdom in the field... Close adherence to this methodology is especially important in cases where the very ease with which the invention can be understood may prompt one 'to fall victim to the insidious effect of a hindsight syndrome wherein that which only the inventor taught is used against its teacher,'... [citations omitted]

Most if not all inventions arise from a combination of old elements... Thus, every element of a claimed invention may often be found in the prior art... However, identification in the prior art of each individual part claimed is insufficient to defeat patentability of the whole claimed invention... Rather, to establish obviousness based on a combination of the elements disclosed in the prior art, there must be some motivation, suggestion or teaching of the desirability of making the specific combination that was made by the applicant... Even when obviousness is based on a single

prior art reference, there must be a showing of a suggestion or motivation to modify the teachings of that reference...." [citations omitted]

Here, there has been no showing of a suggestion or motivation to modify Dunand to arrive at the claimed invention. Takagi is cited as supplying teachings admittedly missing from Dunand, yet there is no teaching or suggestion from Takagi to modify Dunand with a diagnostic mode as in Claim 1. Dunand teaches measuring the position of a mark printed during each swath of a print job, and correcting a voltage applied to drops during printing of the next swath. Dunand does not teach or suggest a diagnostic mode as recited in Claim 1. Applicants respectfully submit that the combination of references to form the grounds for the rejection is the product of improper hindsight reconstruction, using only applicants' specification as a blue print in an attempt to find isolated elements of the claimed invention.

Similar considerations apply to Claims 6, 10, 15 and 22.

Claim 6 as amended is drawn to a diagnostic method for visual detection of poor media advance calibration in an ink-jet printing system, comprising:

- checking for printhead health and taking any corrective needed action to recover nozzle health;

- during a diagnostic mode in which normal printing jobs of the printing system are not printed, printing different areas of a diagnostic pattern at different passes of one or more ink-jet printheads with a controlled amount of media advances between the passes, to accumulate media advance error between the printing of the different areas; and

- examining the diagnostic pattern to determine whether the accumulated media advance error is sufficiently objectionable to take corrective action.

Claim 6 is even further distinguished from the combination of Dunand and Takagi because Takagi does not take any needed corrective action to recover nozzle health.

Claim 10 is drawn to a diagnostic method for visual detection of poor media advance calibration in an ink-jet printing system, comprising:

- providing an ink-jet printhead mounted on a carriage, the carriage mounted for movement along a scan axis;

- providing a media advance system for advancing a print medium along a media path which is transverse to the scan axis;

- entering a diagnostic multi-pass print mode in which mode normal printing jobs of the printing system are not printed;

- printing different areas of a diagnostic plot at different passes using said ink-jet printhead with a controlled amount of media advances between the passes to accumulate media advance error between the printing of the different areas; and

- examining the diagnostic plot to determine whether the accumulated media advance error is sufficiently objectionable to take corrective action.

Claim 10 is further distinguished from the combination of Dunand and Takagi, because neither reference discloses entering a diagnostic multi-pass print mode as recited in Claim 10. Claims 15 and 22 also recite "entering a diagnostic multi-pass print mode" and are also further distinguished from the applied references.

The dependent claims add further distinguishing features.

Because a prima facie case of obviousness has not been established, the rejection of Claims 1, 5-6, 10-11, 14-15 and 22 should be withdrawn.

Claims 7 and 16 stand rejected under 35 USC 103 as being unpatentable over Dunand in view of Takagi and Maeda. This ground of rejection is respectfully traversed, for reasons discussed above regarding Claims 1 and 10. A prima facie case of obviousness has not been established.

The Examiner agrees that Dunand and Takagi do not disclose the features of dependent Claims 7 and 16. Maeda is cited as allegedly showing printing different areas of a diagnostic plot. Applicants respectfully disagree with the

recitation of the alleged teachings of Maeda. The embodiment illustrated in FIGS. 7-10 of Maeda is directed to the problem of an ink drawing phenomenon causing bleeding, resulting from laying down a dot right next to a just previously deposited dot. By depositing respective dots in a checkerboard fashion, the ink drawing phenomenon is said to be avoided. FIGS. 10A-10D show the technique of checkerboard printing using respective mask patterns. See, Maeda at 10:35 to 11:54.

The passages of Maeda cited by the Examiner do not pertain to a "diagnostic plot," or a "diagnostic multi-pass print mode mask," but rather to techniques of printing to avoid bleed during normal print operations.

Because Dunand and Takagi admittedly do not show the features of Claims 7 and 16, and because Maeda does not supply the missing teachings of these claims, a prima facie case of obviousness has not been established. Applicants respectfully submit that the combination of references to form the grounds for the rejection is the product of improper hindsight reconstruction.

Claims 3, 8-9, 12, 17-18 and 20-21 stand rejected under 35 USC 103 as being unpatentable over Dunand in view of Yen et al. ("Yen"). This rejection is respectfully traversed on the ground that a prima facie case of obviousness has not been established, and the applied references do not teach or suggest the claimed invention.

Dunand has been discussed above, and does not teach or suggest the features of these claims, for reasons similar to those discussed above. Applicants respectfully deny the Examiner's allegations regarding the teachings of Dunand regarding Claims 3, 8-9, 12, 17-18 and 20-21.

Yen is cited as allegedly disclosing "printing patterns including the first $w/2$ pixels in the row are printed in the same pass, and the last $w/2$ pixels in the row are printed in another pass, wherein said diagnostic print mode mask includes a row wherein said first $w/2$ pixels are printed in a first pass, and said last $w/2$ pixels are printed in a last pass of said plurality of passes (FIG. 6), and wherein said

different areas are nominally aligned along a horizontal line (FIG. 3)." Applicants respectfully deny that Yen discloses the foregoing teachings.

The Examiner holds that it would have been obvious to "modify the diagnostic print pattern disclosed by Dunand such as the first w/2 pixels are printed in a first pass and the last w/2 pixels are printed in a last pass of said plurality of passes as disclosed by Yen et al. The motivation of doing so is to eliminate unpleasant banding artifacts caused by ink migration as taught by Yen et al. (Abstract)." Applicants respectfully traverse this holding.

Yen discloses a mask pattern having 4 by 4 triangular tiling clusters, as shown in FIG. 6, which provide a balance between reduction of banding artifacts and increase in image granularity. The mask pattern is not described as a diagnostic print mask, nor does Yen describe printing a diagnostic pattern as recited in Claim 3. The Examiner refers to FIG. 3 as allegedly disclosing "said different areas are nominally aligned along a horizontal line," yet FIG. 3 is said to be a printed image produced by an inkjet printer, effectively 60x magnified to show a banding phenomenon. (1: 61-65) It is not seen how this figure supports the Examiner's contentions.

Further, there appears no logical reason to modify Dunand as suggested by the Examiner. Apparently the modification would result in the marks printed in the margin being printed in different passes. Yet this modification does not result in a diagnostic method meeting the claim limitations, e.g. that the different passes be printed with a controlled amount of media advances between the passes. Here again, the rejection appears to be the product of attempted improper hindsight reconstruction, without reasoning clearly supporting the modification.

Similar considerations apply to Claims 8, 17, 18, 20 and 21.

The rejection under Section 103 should be withdrawn on the grounds that a prima facie case of obviousness has not been established. Applicants respectfully submit that the combination of references to form the grounds for the rejection is the product of improper hindsight reconstruction.

The Examiner further alleges at page 6 of the office action that Yen's mask can be used as a diagnostic print mask, on the grounds that in a print masking technique, a mask can be printed for testing purposes and image printing, and therefore Yen's mask pattern still reads on the claim language. Applicants respectfully disagree with this holding, which appears based on the personal knowledge of the Examiner. Applicants respectfully request, pursuant to 37 CFR 1.104(d)(2), that the Examiner provide an affidavit specifying the factual basis for the allegation that Yen's mask pattern can be used for testing purposes, and more particularly, the printing of a diagnostic pattern as recited in the claims.

Claims 4 and 13 stand rejected as being unpatentable over Dunand in view of Takagi and Otsuki et al. ("Otsuki"). This ground of rejection is respectfully traversed, on the grounds that a prima facie case of obviousness has not been established, and the applied references do not teach or suggest the claimed invention.

The Examiner alleges that Dunand as modified discloses the claimed invention, except where the "step of examining the diagnostic pattern is conducted visually by a user." Otsuki is cited as allegedly disclosing a process in a printer including a step of examining the diagnostic pattern visually by a user. The Examiner holds that it would have been obvious to modify the examining process of the diagnostic pattern of Dunand such that the diagnostic pattern is conducted visually by a user as disclosed by Otsuki, and that the motivation of doing so is to correct the advance media error by inputting correction values or adjusting parameters of the system which are done by the user as taught by Otsuki. Applicants respectfully traverse this holding.

Dunand has been discussed above. The reference describes printing a mark on each swath during normal printing, and measuring the position of that mark against its nominal position. One of ordinary skill would not replace the optical sensor system of Dunand with a manual system of user examination, for several reasons. One is that a user would be extremely unlikely to be able to visually measure the position of a mark against some nominal position.

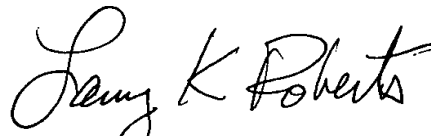
A second reason is that printing speed would be slowed to a virtual crawl, since a measurement is made on each swath. Essentially, the modification suggested by the Examiner would render the printer of Dunand unsatisfactory for its intended purpose; in such a case, there is no suggestion or motivation to make the proposed modification. MPEP 2143.01; In re Gordon, 221 USPQ 1125 (Fed.Cir. 1984).

As for Claim 13, Dunand does not disclose all features of this claim except for user examination of a diagnostic pattern, including for example "entering a diagnostic multi-pass print mode" and "printing different passes of a diagnostic plot at different passes...". Thus, Claim 13 is further distinguished from the Examiner's combination of references.

CONCLUSION

The outstanding rejections should be withdrawn. A prima facie case of obviousness has not been established. The applied references alone or in combination do not teach or suggest the claimed invention. Applicants respectfully submit that the application should be allowed.

Respectfully submitted,



Larry K. Roberts
Registration No. 28,464

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Law Offices of Larry K. Roberts, Inc.
P.O. Box 8569
Newport Beach, CA 92658-8569
Telephone (949) 640-6200
Facsimile (949) 640-1206